National Advisory Committee for Aeronautics

Research Abstracts

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NOTICE

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CURRENT NACA REPORTS

NACA Rept. 1070

MATRIX METHOD OF DETERMINING THE LONGITUDINAL-STABILITY COEFFICIENTS AND FREQUENCY RESPONSE OF AN AIRCRAFT FROM TRANSIENT FLIGHT DATA. James J. Donegan and Henry A. Pearson. 1952. ii, 11p. diagrs., 3 tabs. (NACA Rept. 1070. Formerly TN 2370)

A method is presented for obtaining the over-all longitudinal-stability coefficients and frequency response of an aircraft from an analysis of arbitrary maneuvers in which simple instrumentation is used. Although the method presented deals entirely with the aircraft, it is equally applicable to other problems which can be expressed by second-order differential equations.

NACA TN 2839

DEVELOPMENT OF TURBULENCE-MEASURING EQUIPMENT. Leslie S. G. Kovásznay. National Bureau of Standards. January 1953. 86p. diagrs., photos. (NACA TN 2839)

Hot-wire turbulence-measuring equipment has been developed to meet the more-stringent requirments involved in the measurement of fluctuations in flow parameters at supersonic velocities. The higher mean speed necessitates the resolution of higher frequency components than at low speed, and the relatively low turbulence level present at supersonic speed makes necessary an improved noise level for the equipment. The equipment covers the frequency range from 2 to 70,000 cycles per second. The equipment is adaptable to all-purpose turbulence work with improved utility and accuracy over that of older types of equipment. Sample measurements are given to demonstrate the performance.

NACA TN 2856

ESTIMATED POWER REDUCTION BY WATER INJECTION IN A NONRETURN SUPERSONIC WIND TUNNEL. Morton Cooper and John R. Sevier, Jr. January 1953. 19p. diagrs., tab. (NACA TN 2856)

A simplified analysis has been made to estimate the extent to which the pressure ratio and power of a nonreturn supersonic wind tunnel operating in the low supersonic Mach number range can be reduced by the evaporation of water injected into the diffuser. It appears to be theoretically possible to reduce the power by as much as 20 percent for a typical example of a tunnel operating at a Mach number of 1.4 and at the following stagnation conditions: pressure, 15 pounds per square inch; temperature, 200° F; and dew point, 0° F or less. For a tunnel having a test section of 50 square feet, the amount of water injected would be about 300 gallons per minute and the power saved, about 7,000 horsepower. The power required to provide the necessary water and the possible increases in diffuser losses associated with water injection must, of course, be weighted against the theoretical power saving.

NACA TN 2864

CONVECTION OF A PATTERN OF VORTICITY THROUGH A SHOCK WAVE. H. S. Ribner. January 1953. ii, 48p. diagrs. (NACA TN 2864)

An arbitrary weak spatial distribution of vorticity can be represented in terms of plane sinusoidal shear waves of all orientations and wave lengths (Fourier integral). The analysis treats the passage of a single representative weak shear wave through a plane shock and shows refraction and modification of the shear wave with simultaneous generation of an acoustically intense sound wave. Applications to turbulence and to noise in supersonic wind tunnels are indicated.

NACA TN 2865

INVESTIGATION OF GASES EVOLVED DURING FIRING OF VITREOUS COATINGS ON STEEL.

*AVAILABLE ON LOAN ONLY.

ADDRESS REQUESTS FOR DOCUMENTS TO NACA, 1724 F ST., NW., WASHINGTON 25, D. C., CITING CODE NUMBER ABOVE EACH TITLE; THE REPORT TITLE AND AUTHOR.

Dwight G. Moore and Mary A. Mason, National Bureau of Standards. January 1953. 34p. diagrs., photos., 7 tabs. (NACA TN 2865)

A study was made of the nature and source of gases evolved when a ground-coat enamel is applied to low-carbon steel. The principal gases evolved were found to be carbon monoxide, carbon dioxide, and hydrogen. The cause of primary boil was determined as the evolution of carbon gases from the oxidation of carbon in the steel. Further results indicate that hydrogen, formed from the reaction between dissolved water in the coating and the hot iron base, diffuses into the coating as firing continues. On fast cooling the hydrogen is expelled causing bubbles to form at the interface of the coating. Practically all of the bubble structure in a normally fired enamel was found to be due to some impurity in the clay addition which may be organic matter adsorbed on the clay particles.

NACA TN 2868

REFLECTION OF A WEAK SHOCK WAVE FROM A BOUNDARY LAYER ALONG A FLAT PLATE. I - INTERACTION OF WEAK SHOCK WAVES WITH LAMINAR AND TURBULENT BOUNDARY LAYERS ANALYZED BY MOMENTUM-INTEGRAL METHOD. Alfred Ritter and Yung-Huai Kuo, Cornell University. January 1953. 66p. diagrs., tab. (NACA TN 2868)

The present paper is concerned with the phenomena encountered when a plane oblique shock wave is incident upon the boundary layer of a flat plate. The problem has been simplified by dividing the flow field into a viscous layer near the wall and a supersonic potential outer flow. Ordinary linearized theory has been applied to the outer flow inasmuch as the study has been restricted to infinitesimal compression waves and only small perturbations are encountered. The paper deals primarily with the case of laminar flow and the boundary-layer treatment is based upon the momentum-integral equation previously derived by Howarth.

NACA TN 2869

REFLECTION OF WEAK SHOCK WAVE FROM A BOUNDARY LAYER ALONG A FLAT PLATE. II - INTERACTION OF OBLIQUE SHOCK WAVE WITH A LAMINAR BOUNDARY LAYER ANALYZED BY DIFFERENTIAL-EQUATION METHOD. Yung-Huai Kuo, Cornell University. January 1953. 60p. diagrs. (NACA TN 2869)

By analogy with the boundary-layer concept, the flow produced by the interaction between a shock wave and a laminar boundary layer is subdivided into a viscous layer and a potential field. The assumptions that the compressibility effect in the inner layer is negligible and that the original flow in the outer layer is uniform lead to simple analytical solutions using a differential-equation method to determine the perturbed flow. The joining conditions at the interface between the layers determine an eigenvalue which gives the rate of decay and the character of the disturbances both upstream and downstream of the point of incidence.

NACA TN 2870

POWER-OFF FLARE-UP TESTS OF A MODEL HELICOPTER ROTOR IN VERTICAL AUTOROTATION. S. E. Slaymaker and Robin B. Gray, Princeton University. January 1953. 36p. diagrs., photos. (NACA TN 2870)

The problem of reducing the descending velocity of a helicopter model in steady vertical autorotation by expending the kinetic energy of the rotor in a collective-pitch flare was investigated experimentally. Test data were obtained over a wide range of operating conditions from a freely falling model rotor restrained laterally by a guide wire. The results indicate the influence of disk loading and rotor inertia on a given rotor configuration under various flare conditions. A semiempirical method was developed for predicting the flare performance of the model. The accuracy of the method was checked experimentally for all model configurations and sample calculations were made for two full-scale helicopters. The method yields results which compare favorably with experimental data.

NACA TN 2871

EXPERIMENTAL INVESTIGATION OF LOSS IN AN ANNULAR CASCADE OF TURBINE-NOZZLE BLADES OF FREE VORTEX DESIGN. Hubert W. Allen, Milton G. Kofskey and Richard E. Chamness. January 1953. 33p. diagrs., photos., tab. (NACA TN 2871)

Losses originating in a cascade of turbine-nozzle blades of free-vortex design were investigated quantitatively at two Mach numbers, and visual studies were also made of the boundary-layer flow on blade and shroud surfaces. High loss regions were found near the corners between the suction side of the wake and the shrouds. These losses were accompanied by high discharge-angle gradients. Visual traces of shroud boundary-layer flow showed a cross-channel component of velocity and indicated one source fo the accumulation of low-momentum fluid comprising the loss region. Results of a shift of the loss region and visual indications of the boundary-layer flow along the blade surfaces at the higher Mach number showed that the low-momentum fluid originating on the outer shroud and blade surfaces flows radially inward through a thickened portion of the boundary layer on the blade suction surface and along the trailing edge in the wake of the blades.

NACA TN 2872

THE EFFECT OF INITIAL CURVATURE ON THE STRENGTH OF AN INELASTIC COLUMN. Thomas W. Wilder, III, William A. Brooks, Jr., and Eldon E. Mathauser. January 1953. 17p. diagrs. (NACA TN 2872)

The reduction in column strength due to initial curvature is determined theoretically for a pin-ended idealized inelastic H-section column. Equations

relating load and lateral deflection are obtained which permit a systematic variation in the parameters representing the stress-strain properties, column proportions, and initial curvature of the column. The results, presented graphically, show the effect on column strength for various combinations of these parameters.

NACA TN 2873

THE EFFECT OF LONGITUDINAL STIFFENERS LOCATED ON ONE SIDE OF A PLATE ON THE COMPRESSIVE BUCKLING STRESS OF THE PLATE-STIFFENER COMBINATION. Paul Seide. January 1953. 66p. diagrs., 2 tabs. (NACA TN 2873)

The problem of buckling under uniform compression of flat, simply supported, rectangular plates with equally spaced longitudinal stiffeners on one side of the plate is investigated. For the case of a plate with one, two, or infinitely many stiffeners, the analysis yields expressions for the effective moment of inertia of the stiffeners that can be used in conjunction with the buckling charts previously presented in NACA TN 1825.

NACA TN 2874

ON TRAVELING WAVES IN BEAMS. Robert W. Leonard and Bernard Budiansky. January 1953. 76p. diagrs., tab. (NACA TN 2874)

The basic equations of Timoshenko for the motion of vibrating nonuniform beams, which allow for effects of transverse shear deformation and rotary inertia, are presented in several forms; the propagation of sharp disturbances is discussed. Numerical traveling-wave solutions are obtained for some elementary problems of finite uniform beams for which the propagation velocities of shear and bending discontinuities are equal. Comparisons are made with modal solutions and, in some cases, with exact closed solutions.

NACA TN 2875

BEHAVIOR IN PURE BENDING OF A LONG MONOCOQUE BEAM OF CIRCULAR-ARC CROSS SECTION. Robert W. Fralich, J. Mayers and Eric Reissner. January 1953. 33p. diagrs. (NACA TN 2875)

An analysis is made of the behavior under a loading of pure bending moment of a thin, infinitely long, pure-monocoque beam having a constant, doubly symmetric, circular-arc cross section. Bending moments, deflections, and stresses are obtained. The analysis shows a nonlinear behavior in bending which leads ultimately to a maximum moment and instability.

NACA TN 2876

THE PLANING CHARACTERISTICS OF TWO V-SHAPED PRISMATIC SURFACES HAVING ANGLES OF DEAD RISE OF 20° and 40°. Derrill B. Chambliss and George M. Boyd, Jr. January 1953. 38p. diagrs., photos., 2 tabs. (NACA TN 2876)

An investigation was conducted to determine the principal planing characteristics of two V-shaped surfaces having angles of dead rise of 20° and 40°. The data indicate that, for a given condition of load, speed, and trim, the wetted length, distance of center of pressure from trailing edge, and drag increase with an increase in the angle of dead rise.

NACA TN 2877

ON THE USE OF A DAMPED SINE-WAVE ELEVATOR MOTION FOR COMPUTING THE DESIGN MANEUVERING HORIZONTAL-TAIL LOAD. Melvin Sadoff. January 1953. 32p. diagrs., 3 tabs. (NACA TN 2877)

An analysis was made to evaluate the assumption of a damped sine-wave elevator motion for computing the design maneuvering load on the horizontal tail. Also investigated was the effect of control frequency on the tail load. The results indicated that the tail loads computed by the method of the present report agreed closely with the loads computed by a method currently specified for use in the U.S. Air Force structural loading requirements. For a given design normal acceleration factor, it was found that an increase in control frequency resulted in a marked increase in both the negative and positive peak tail loads attained during the assumed maneuvers.

NACA TN 2878

COMBINED EFFECT OF DAMPING SCREENS AND STREAM CONVERGENCE ON TURBULENCE. Maurice Tucker. January 1953. i, 62p. diagrs., tab. (NACA TN 2878)

The analysis treats, in the absence of turbulent decay processes, the combined effect of a series of identical damping screens followed by a stream convergence upon the mean-square fluctuation velocities, scales, correlation coefficients, and one-dimensional spectra of a convected field of turbulence described by a triple Fourier integral superposition of plane transverse waves. Numerical results are tabulated for the case of upstream isotropic turbulence. An approximate method for taking into account the effects of turbulent decay upon the mean-square fluctuation velocities is also presented.

NACA TN 2879

UNSTEADY OBLIQUE INTERACTION OF A SHOCK WAVE WITH A PLANE DISTURBANCE. Franklin K. Moore. January 1953. 66p. diagrs. (NACA TN 2879)

Analysis is made of the flow fietd produced by oblique impingement of weak plane disturbances of arbitrary profile on a plane normal shock. Three types of distrubance are considered: (a) Sound wave propagating in the gas at rest into which the shock moves. The sound wave refracts either as a simple isentropic sound wave or an attenuating isentropic pressure wave, depending on the angle between the shock and the incident sound wave. A stationary vorticity wave of constant pressure appears behind the shock. (b) Sound wave overtaking the shock from behind. The sound wave reflects as a sound wave, and a stationary vorticity wave is produced. (c) An incompressible vorticity wave stationary in the gas ahead of the shock. The incident wave refracts as a stationary vorticity wave, and either a sound wave or attenuating pressure wave is also produced. Computations are presented for the first two types of incident wave, over the range of incidence angles, for shock Mach numbers of 1, 1.5, and ∞.

NACA TN 2880

A DIGITAL AUTOMATIC MULTIPLE PRESSURE RECORDER. Bert A. Coss, D. R. Daykin, Leonard Jaffe and Elmer M. Sharp. January 1953. 24p. diagrs., photo. (NACA TN 2880)

A machine is described which will automatically measure and record 100 pressures in a range from 5 to 65 inches of mercury, in approximately 2-1/2 minutes, to an accuracy of 0.1 inch of mercury. The method used is to compare the unknown pressures with a scanning pressure whose value at any instant is known in digitalized form. Sensitive diaphragms indicate balance between the unknown and the scanning pressures. All unknown pressures are compared with the scanning pressure simultaneously and the information is stored temporarily within the machine. During read out, the information is properly sequenced, identified, coded, and punched into paper tape, which is the actual permanent record of the output of the machine, although typewritten tabulated data may also be produced. The punched paper tape may be used subsequently either to tabulate data or to punch cards automatically for use in punched-card calculators.

NACA TN 2882

THEORETICAL INVESTIGATION OF THE LONGITUDINAL RESPONSE CHARACTERISTICS OF A SWEPT-WING FIGHTER AIRPLANE HAVING A PITCH-ATTITUDE CONTROL SYSTEM. Fred H. Stokes and J. T. Matthews. January 1953. 41p. diagrs., tab. (NACA TN 2882)

An analysis is made of a pitch-attitude control system, both with and without rate feedback, as applied to a swept-wing fighter airplane. The results show the response characteristics of the airplane-autopilot combination. The effects that changes in altitude and Mach number have on these response characteristics are investigated, as are the effects of changes in the rate and error gain settings of the system.

NACA TN 2883

BEARING STRENGTHS OF SOME 75S-T6 AND 14S-T6 ALUMINUM-ALLOY HAND FORGINGS. E. M. Finley, Aluminum Company of America. January 1953. 24p. diagrs., photos., 4 tabs. (NACA TN 2883)

Results are given from an investigation of bearing properties of some 75S-T6 and 14S-T6 aluminum-alloy hand forgings in the longitudinal and long transverse directions and in surface and center locations. The tensile properties of the forgings were above those specified for such material and showed the expected directional or locational characteristics. The bearing properties showed less directional or locational variations than did the tensile properties. Ratios of bearing to longitudinal tensile strengths are summarized and nominal values are recommended for use in selecting design bearing strengths.

NACA TN 2887

ON THE STABILITY OF THE LAMINAR MIXING REGION BETWEEN TWO PARALLEL STREAMS IN A GAS. C. C. Lin, Massachusetts Institute of Technology. January 1953. 50p. diagrs., 5 tabs. (NACA TN 2887)

A study was made of the stability of the mixing of two parallel streams in a gas. It is shown that, when the relative speed of the two parallel streams exceeds the sum of their velocities of sound, subsonic oscillations cannot occur and the mixing region may be expected to be stable with respect to small disturbances. It is further shown that, when viscosity and heat conductivity are neglected, if the flow can execute a small neutral subsonic disturbance it can also execute self-excited oscillations of longer wave lengths and damped oscillations of shorter wave lengths. Additional developments of the mathematical theory of asymptotic solutions showed that, at high Reynolds numbers, the damped oscillations in a strictly parallel main flow have a structure similar to that of the vorticity field in fully developed flow.

NACA TM 1342

SPIRAL MOTIONS OF VISCOUS FLUIDS. (Spiralförmige Bewegungen zäher Flüssigkeiten). Georg Hamel. January 1953. 44p. (NACA TM 1342. Trans. from Deutsche Mathematiker-vereinigung, Jahresbericht, v. 25, 1917, p. 34-60).

Exact solutions of the steady incompressible viscous flow equations are obtained. The streamlines corresponding to such solutions are in general logarithmic spirals. The more specific cases of purely concentric and purely radial flows are fully investigated. Corresponding to the radial flows are the physically important cases of flow in radially convergent channels and in divergent channels. A second method is used to investigate exact steady and unsteady two-dimensional motions in free spirals. Neighborhood solutions to the radial flow are also discussed.

BRITISH REPORTS

N-20292*

Royal Aircraft Establishment (Gt. Brit.)
THE CURRENT AND VOLTAGE RELATIONSHIPS OF A STABLE D.C. ARC BETWEEN COPPER ELECTRODES IN AIR AT 4-760 MM. HG. I. A. Mossop and F. D. Gill. May 1952. 53p. diagrs., photos., 14 tabs. (RAE EL. 1477)

This report describes a method that has been developed for measuring the current and voltage characteristics of a stable d-c arc. The arc is formed between stationary electrodes by first breaking down the gap using a high voltage capacitor discharge. This discharge is allowed to develop into a power arc which is then maintained by a 120 volts accumulator supply. The arc current and voltage are measured on peak voltmeters which are switched into the circuit only after the arc has become stable. Switching is done automatically by a "sequence controller" which also opens the main circuit breaker as soon as the measurements have been made. In this way electrode wear is reduced to a minimum. The methods of previous workers using oscillographic-film techniques are reviewed critically; the advantages of the new method of measurement are great saving in time and labor, increased accuracy due to the measurement of true stable arc characteristics, and freedom from the complications of moving electrodes such as the measurement of instantaneous gap length. An appendix describes a statistical method of analyzing the experimental results which, apart from minimizing the troublesome effects of random scatter on the analysis, ends by giving the results in the form of a single expression which has been presented as a nomograph. This research is part of a general program of investigation of the effects of reduced gas pressure on the behavior of an arc. This report gives the results that have been obtained for copper electrodes in air in the pressure range 4-760 mm Hg at currents between 1 and 17 amps and for gaps up to 2 mm in length.

N-20295*

Royal Aircraft Establishment (Gt. Brit.)
SOME EFFECTS OF PITOT SIZE ON THE MEASUREMENTS OF BOUNDARY LAYERS IN SUPERSONIC FLOW. F. V. Davies. August 1952. 40p. diagrs. (RAE Tech. Note Aero 2179)

This note describes some effects of pitot size on measurements of laminar boundary layers on a flat plate and cones in a 5- by 5-inch supersonic wind tunnel at $M_\infty = 2.43$, Reynolds

number/inch = 0.25×10^6 and compares them with results obtained by other investigators.

N-20500*

Ministry of Supply (Gt. Brit.)
AIRCRAFT PRIMARY STRUCTURES IN WELDED MAGNESIUM ALLOY. 1951. i, 28p. diagrs., photos., 3 tabs. (MOS S & TM 5/52; Bristol Aeroplane Co., Ltd.)

The use of magnesium-zirconium alloys in sheet and plate form, joined by arc welding, for the primary structure of aircraft is studied. A detailed description is given of the welding equipment and technique used in the magnesium-zinc-zirconium sample found to be more promising from the standpoint of weldability, strength, and resistance to stress corrosion.

N-20501*

Royal Aircraft Establishment (Gt. Brit.)
NOTES ON TRANSDUCTOR DESIGN AND CORE MATERIALS. A. G. Milnes and A. R. George. August 1952. 31p. diagrs., 4 tabs. (RAE Tech.Note EL.40)

Transductor performance with Mumetal or silicon-iron cores is examined for a series circuit with complete self-excitation, and design data are obtained for 50, 400 and 1600 c/s operation. The influence of supply voltage or core flux density on the sensitivity and linearity is examined. The results are compared with experiments reported earlier with crystalloy and H.C.R. cores. Three design methods are described: one is based on idealized theoretical equations, another on load line techniques, and the third is based on the similarity in shape of the transductor characteristic to the B-H curve of the core. A specimen design calculation is given to illustrate the use of the design data. The methods described are applicable to both separately excited and auto-self-excited types of connections.

N-20509*

Marine Aircraft Experimental Establishment (Gt. Brit.) THE M.A.E.E. RECORDING ACCELEROMETER. D. M. Ridland and R. Parker. September 1952. 15p. diagrs., photos. (MAEE F/Res/226)

The M.A.E.E. recording accelerometer is basically the accelerometer unit of a desynn accelerometer, adapted to make a continuous and immediate presentation of accurate, calibrated accelerations on a half second time base. The recording medium is metallized paper, having a speed of half an inch per second, and the instrument can be operated continuously for twenty minutes on one loading. It can record with full scale deflections, from 1g to 10g, when the natural frequencies will be about 7 and 22 c.p.s. respectively. The instrument is simple, it has been proved reliable and accurate and it is most convenient in use.

N-20515 *

Royal Aircraft Establishment (Gt. Brit.)
A REVIEW AND ASSESSMENT OF VARIOUS FORMULAE FOR TURBULENT SKIN FRICTION IN COMPRESSIBLE FLOW. R. J. Monaghan. August 1952. 49p. diagrs. (RAE Tech. Note Aero 2182)

Despite a lack of experimental evidence, numerous formulas have been developed for the variation of turbulent skin friction on a flat plate in compressible flow, with and without heat transfer. The present note makes an extended comparison of available formulas and examines the assumptions made in their development, checking against experimental evidence where possible.

N-20549*

Aeronautical Research Council (Gt. Brit.)
THE TWO-DIMENSIONAL FLOW OF AN INCOMPRESSIBLE FLUID ABOUT AN AEROFOIL BY THE "INFLUENCE FACTORS" METHOD. L. C. Woods. October 19, 1950. 18p., 3 tabs. (ARC 13,460; FM 1489; Oxford Univ., Engineering Lab. No. 38)

This report describes an exact method of calculating the two-dimensional flow of an incompressible fluid about either a symmetrical or an asymmetric airfoil. The method enables the flow to be calculated at any point in the field. It was originated by Thom, and termed by him "the influence factor method." In this paper, his work on symmetrical airfoils is extended to asymmetric airfoils, and his approximate equations for the bounded stream are replaced by the exact forms.

N-20607*

National Gas Turbine Establishment (Gt. Brit.)
STUDIES ON THE SPONTANEOUS IGNITION OF FUELS INJECTED INTO A HOT AIR STREAM. PART VI. IGNITION DELAY MEASUREMENTS ON ORGANIC COMPOUNDS CONTAINING NITROGEN OR HALOGEN. B. P. Mullins. July 1952. 58p. diagrs., 36 tabs. (NGTE R.106)

Ignition delay measurements have been made upon a number of organic compounds containing nitrogen or halogen using the continuous flow method of test and the nitrogen pressurized fuel system previously described. The present report is mainly a catalogue of the experimental results. The fuels tested may be grouped in the following classes: miscellaneous nitrogen compounds, nitro compounds, nitrite esters, nitrate esters, aliphatic amines, aromatic amines, aliphatic halogen compounds, and aromatic halogen compounds. Acetonitrile is the least ignitable and n-butyl nitrite is the most ignitable of the fuels examined in the test rig. Flame observations were made and activation energies of reaction were computed for each fuel.

N-20608*

National Gas Turbine Establishment (Gt. Brit.)
STUDIES ON THE SPONTANEOUS IGNITION OF FUELS INJECTED INTO A HOT AIR STREAM. PART VII. IGNITION DELAY MEASUREMENTS ON ALCOHOLS AND ETHERS. B. P. Mullins. July 1952. 55p. diagrs., 32 tabs. (NGTE R. 107)

Ignition delay measurements have been made upon a number of alcohols and ethers using the continuous flow method of test and nitrogen-pressurized fuel system previously described, and the present report is mainly a catalogue of the experimental results. The fuels tested may be grouped in the following classes: saturated aliphatic alcohols, miscellaneous alcohols, aliphatic ethers, glycol ethers, and miscellaneous ethers. Furfuryl alcohol is the most ignitable and m-cresol is the least ignitable of the alcohols examined. The ignitability of the n-paraffin alcohols increases as the homologous series is ascended. Propylene oxide is the most ignitable and and di-isopropyl ether is the least ignitable of the ethers examined. Flame observations were made and activation energies of reaction were computed for each fuel.

N-20609*

National Gas Turbine Establishment (Gt. Brit.)
STUDIES ON THE SPONTANEOUS IGNITION OF FUELS INJECTED INTO A HOT AIR STREAM. PART VIII. IGNITION DELAY MEASUREMENTS ON ALDEHYDES, KETONES, ESTERS, CYCLO-COMPOUNDS, HETEROCYCLIC COMPOUNDS AND CARBON DISULPHIDE. B. P. Mullins. July 1952. 79p. diagrs., 28 tabs. (NGTE R. 108)

Ignition delay measurements have been made upon a number of miscellaneous organic compounds using the continuous flow method of test and nitrogen pressurized fuel system previously described and the present report is mainly a catalogue of the experimental results. The fuels tested may be grouped in the following classes: aldehydes, ketones, acetates, miscellaneous esters, cyclo-compounds, furan and its derivatives, miscellaneous heterocyclic compounds, and carbon disulphide. Acrolein is the most ignitable and acetaldehyde is the least ignitable of the aldehydes examined. Diacetyl is the most ignitable and acetone is the least ignitable of the ketones examined. The ignitability of the aliphatic acetates increases as the homologous series is ascended. Carbon disulphide is more ignitable than any of the aldehydes, ketones or acetates tested; at 650° C it has an ignition delay of 11 milliseconds in vitiated air. Flame observations were made and activation energies of reaction were computed for each fuel.

N-20631*

Aeronautical Research Council (Gt. Brit.)
NOTES ON THE DERIVATION OF TRUE AIR TEMPERATURE FROM AIRCRAFT OBSERVATIONS. D. D. Clark. 1952. 8p. diagr., 2 tabs. (ARC CP 90)

This report presents methods of obtaining the true air temperature from aircraft instrument readings.

N-20632*

Aeronautical Research Council (Gt. Brit.)
AN ASSESSMENT OF THE PROBABLE CAUSES OF VARIATION OF THE SPEED CORRECTION COEFFICIENT OF AIRCRAFT THERMOMETERS. D. D. Clark. 1952. 17p. diagrs., 2 tabs. (ARC CP 91)

In M. R. P. 527 Shellard has summarized the evidence indicating that a variation takes place in the speed correction coefficient of aircraft thermometers both with altitude and, in one particular case, with airspeed. He also mentions some possible reasons for the variations. In this report, an attempt has been made to list all factors which could possibly affect the speed correction coefficient and to examine each thoroughly in turn.

N-20633*

Aeronautical Research Council (Gt. Brit.)
THE INFLUENCE OF THE METHOD OF STRINGER ATTACHMENT ON THE BUCKLING AND FAILURE OF SKIN PANELS WITH SQUARE TOP-HAT STRINGERS. Abstract from thesis of E. E. Labram, prepared by K. H. Griffin. 1952. 8p. diagrs., tab. (ARC CP 93)

The results of experiments to find the buckling and failing loads of panels with riveted and glued stringers are given, and a comparison between the two methods of attachment is made. In the case of buckling stresses, a comparison is made with theoretical results.

N-20634*

Aeronautical Research Council (Gt. Brit.)
TESTS IN THE COMPRESSED AIR TUNNEL ON TWO AEROFOIL SECTIONS HAVING A LARGE SCALE EFFECT ON $C_{L_{MAX}}$ AT A CRITICAL REYNOLDS NUMBER. C. Salter, H. M. Lee and R. C. Owen. 1952. 21p. diagrs., 4 tabs. (ARC CP 92)

This report gives results of tests on two "constant velocity" airfoil sections, 9 percent and 11 percent thick, respectively, and of aspect ratio 6, over a range of R of 0.3×10^6 to 7.5×10^6.

N-20635*

Aeronautical Research Council (Gt. Brit.)
IMPROPER INTEGRALS IN THEORETICAL AERODYNAMICS. K. W. Mangler. 1952. 35p. diagr. (ARC CP 94)

This paper deals with an integral, involving a "principal value of the order n." It was first introduced by Hadamard and is a generalization of Cauchy's principal value. It occurs, if one determines the derivatives of an integral, involving Cauchy's principal value.

N-20636*

Aeronautical Research Council (Gt. Brit.)
COMPARISON OF HELICOPTER ROTOR MODEL TESTS OF AERODYNAMIC DAMPING WITH THEORETICAL ESTIMATES. G. J. Sissingh. 1952. 16p. diagrs. (ARC CP 98)

The present report deals with the aerodynamic damping of a rotor oscillating in pitch (or roll) and is mainly concerned with the comparison between theory and experiment. Both the free and forced oscillations of a rotor system pivoted below the rotor center are investigated.

N-20637*

Aeronautical Research Council (Gt. Brit.)
HELICOPTER BEHAVIOUR IN THE VORTEX RING CONDITIONS. W. Stewart. 1952. 16p. diagrs., tab. (ARC CP 99)

This report describes flight experience in the vortex ring conditions with the Sikorsky R-4B, R-6 and S-51, Bell 47 and Bristol 171 helicopters.

N-20638*

Aeronautical Research Council (Gt. Brit.)
THE EFFECT OF INDUCED VELOCITY VARIATION ON HELICOPTER ROTOR DAMPING IN PITCH OR ROLL. G. J. Sissingh. 1952. 16p. diagrs. (ARC CP 101)

The present investigation is a continuation of a recent report by K. B. Amer on the aerodynamic damping of a rotor with centrally arranged flapping hinges in a steady pitching or rolling motion. It considers the effect of variation in the induced velocity due to the changes in the distribution of the thrust around the rotor disk. The results are compared with the flight measurements given in Amer's report and the agreement is good.

N-20675*

Forest Products Research Lab. (Gt. Brit.)
THE RISBOROUGH PLATEN-OVEN; A MACHINE FOR RAPID MOISTURE CONTENT DETERMINATIONS UPON VENEERS. J. F. S. Carruthers and P. M. C. Lacey. (Forest Products Research Lab.; Reprint from Wood, v. 17, Nov., 1952, p. 420-423)

This article describes the machine developed by the Forest Products Research Laboratory and compares some results obtained with it and by other means.

N-20762*

Royal Aircraft Establishment (Gt. Brit.)
GRAVINER STRIP-TYPE CONTACT SWITCHES FOR OPERATION OF AIRCRAFT FIRE EXTINGUISHING

SYSTEMS IN CRASHES. NOTE ON A SIMULATED CRASH-LANDING TEST. E. Bade and I. S. H. Brown. September 1952. 10p. diagrs., photos. (RAE Tech. Note Mech. Eng. 134)

The development of aircraft fire extinguishing systems has included a simulated crash test using a Seafire aircraft to check the performance of a strip-type contact switch developed by the Graviner Manufacturing Co. The contact switch is intended for use in addition to, or as a replacement of, the conventional inertia-types of crash switch which, because of their necessarily high "g" setting, frequently fail to function in crashes of moderate severity. The trial was arranged so that a comparison could be made of the behavior of the strip-type contact switches against the pendulum- and piston-type switches. The results have shown that the contact switch will operate instantly and effectively in a crash landing in which impact is made on the switch. Installation of the contact switch on the surfaces of high-speed aircraft would incur no significant aerodynamic penalty and it appears that both for practical and psychological reasons its adoption for service aircraft would be advantageous. To this end a specification of service requirements is being prepared to enable acceptance tests to be carried out.

MISCELLANEOUS

NACA TN 2552

Errata No. 1 on "CONSIDERATIONS ON THE EFFECT OF WIND-TUNNEL WALLS ON OSCILLATING AIR FORCES FOR TWO-DIMENSIONAL SUBSONIC COMPRESSIBLE FLOW". Harry L. Runyan and Charles E. Watkins. December 1951.

NACA TN 2861

Errata No. 1 on "ANALYTICAL INVESTIGATION OF ICING LIMIT FOR DIAMOND-SHAPED AIRFOIL IN TRANSONIC AND SUPERSONIC FLOW." Edmund E. Callaghan and John S. Serafini. January 1953.

NACA TN 2866

Errata No. 1 on "ICING PROTECTION FOR A TURBOJET TRANSPORT AIRPLANE: HEATING REQUIREMENTS, METHODS OF PROTECTION, AND PERFORMANCE PENALTIES." Thomas F. Gelder, James P. Lewis and Stanley L. Koutz. January 1953.

UNPUBLISHED PAPERS

N-19412*

Experimental Towing Tank, Stevens Inst. of Tech. TURBULENCE STIMULATION IN THE BOUNDARY LAYER OF PLANING SURFACES. PART I. REVIEW OF ANALYTICAL AND EXPERIMENTAL ASPECTS OF THE SUBJECT. B. V. Korvin-Kroukovsky, Edward W. Ross and Daniel Savitsky. Appendix I: CALCULATIONS ON LAMINAR AND TURBULENT BOUNDARY LAYER. Edward W. Ross. August 1952. i, 116p. diagrs., photos. (Experimental Towing Tank, Stevens Inst. of Tech. Rept. 443)

This is the first report in a series by the Stevens Institute of Technology on the subject of investigating means of stimulating and detecting boundary layer turbulence in tests of planing surface and seaplane hull models. This report presents the results of an analytical survey of the existing literature on the subject.

N-19413*

Experimental Towing Tank, Stevens Inst. of Tech. TURBULENCE STIMULATION IN THE BOUNDARY LAYER OF PLANING SURFACES. PART II. PRELIMINARY EXPERIMENTAL INVESTIGATION. Daniel Savitsky and Edward W. Ross. August 1952. i, 57p. diagrs., photos., tab. (Experimental Towing Tank, Stevens Inst. of Tech. Rept. 444)

This is the second report in a series by the Stevens Institute of Technology on the subject of investigating means of stimulating and detecting boundary layer turbulence in tests of planing surface and seaplane hull models. This report describes tests using a turbulence inducing strut and the Royal Aircraft Establishment chemical paint turbulence detection technique.

N-19616*

Virginia U.
EXPLORATORY INVESTIGATIONS OF THE RESISTANCE OF SOME METALS UNDER STRESS. L. G. Hoxton. July 1952. i, 51p. diagrs., photo., tab. (Virginia U.)

The purpose of these investigations was to try to find new facts about metals that might ultimately contribute to the art of making measurements with electrical resistance strain gages. This report is a study of the conducting properties of metals under longitudinal stresses, particularly within their elastic ranges.